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APICAL SHELL SCULPTURE OF SOME NORTH AMERICAN FRESHWATER LIMPETS (GASTROPODA: BASOMMATOPHORA)

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ABSTRACT. The present paper describes the apical sculpture of some North American ancylid mollusks in a more detailed way than has been possible previously. The microsculpture of representative groups was studied by the use of the Scanning Electron Microscope (SEM). The clearer observations of the shell apical microsculpture have not shown the need of any generic revisions in the present system of classification in which the generic groups are already based on apical sculpture.

Apical shell sculpture traditionally has been important in the delineation of generic groups in the freshwater limpet family Ancylidae. Because of the greater resolution afforded by the Scanning Electron Microscope (SEM) in studying surface details of minute objects, we employed the SEM for a closer, more detailed look at ancylid shell apex microsculpture than has been possible in the past. The present paper describes the apical sculpture of some North American ancylid mollusks with the use of the SEM.

METHODS AND MATERIALS

The shells of ancylid mollusks were cleaned by immersing them in sodium hypochlorite (commercial "Clorox"), removing the periostracum and rinsing the shells in distilled

water. They were then air-dried and glued with Duco cement or aluminum paint to the holder to be used in the SEM. The shells were coated with gold and viewed and photographed with a JEOL (Ltd.) JSM–U3 Scanning Electron Microscope. Photographs were taken variously at magnifications of 100×, 200×, 300×, 600× and 1000× with Polaroid P–51 P–N film.

The specimens used in this study were as follows:

Ferrissia rivularis (Say 1817) (Pl. 5, Fig. 1; Pl. 6, Figs. 1, 2) UMMZ 69189. Muscle Shoals, Tennessee River, Lauderdale County, Alabama. H. H. Smith.

Ferrissia shimeki (Pilsbry 1890). Pl. 5, Fig. 2; Pl. 6, Figs. 3, 4) UMMZ 69610. Deadman's Run, Lincoln, Lancaster County, Nebraska. Bryant Walker Collection.

Ferrissia walkeri (Pilsbry and Ferriss 1906). (Pl. 5, Fig. 3; Pl. 7, Fig. 1). UMMZ 101984. Camp Colfax, La Porte, La Porte County, Indiana. Daniels Collection.

"Gundlachia" californica Rowell 1863. (Pl. 5, Fig. 4; Pl. 7, Fig. 2). UMMZ 143954. Near Oakland, Alameda County, California. Kent Science Institute Collection.

Laevapex diaphanus (Haldeman 1841). (Pl. 5, Fig. 5; Pl. 7, Figs. 3, 4; Pl. 8, Figs. 1, 2). UMMZ 68922. Tennessee River, Knoxville, Knox County, Tennessee. W. B. Barber.

Laevapex fuscus (Adams 1841). (Pl. 5, Fig. 6). UMMZ 100445. Headwater of the Miami River, Ohio. J. B. Henderson Collection.

Hebetancylus excentricus (Morelet 1851). (Pl. 5, Fig. 7; Pl. 8, Figs. 3, 4). UMMZ 100404. Gargitas Creek, Victoria County, Texas. J. D. Mitchell.

Rhodacmea filosus (Conrad 1834). (Pl. 5, Fig. 8; Pl. 9, Figs. 3, 4). UMMZ 69215. Tallaseehatchee Creek, 4 miles above Childersburg, Talladega County, Alabama. H. H. Smith.

Rhodacmea (*Rhodocephala*) *rhodacme* Walker 1917. (Pl. 5, Fig. 9; Pl. 9, Figs. 1, 2). UMMZ 68928. Coosa River, Leoto Shoals, St. Clair County, Alabama. H. H. Smith.

Observations

Ferrissia rivularis. At the exact center of the apex is a very regular pit (the "apical scar" of Pilsbry, 1896 and Bourguignat, 1853) surrounded by a relatively smooth circular area with a radius of about 0.1 mm. From this central smooth area radiate narrow grooves, uniform in width and more or less equally spaced. As the grooves radiate outward from the apex toward the shell apertural margin, the spaces between them widen, and new grooves are formed. In the grooves are concentric, irregularly spaced concentric ridges (?"growth lines"), rather regularly spaced down the length of the groove. The radial grooves terminate rather abruptly about 0.4–0.5 mm distally from the apical scar.

Ferrissia shimeki. The apical sculpturing of the two specimens studied was nearly identical, and basically quite similar to that described for *F. rivularis.* The concentric ridges in and running transversely to the direction of the grooves are a little more prominent in *F. shimeki.*

Ferrissia walkeri. The apical sculpture of this species seems to be practically identical to that of the two species described above.

"Gundlachia" californica. The apical sculpture is nearly identical to that observed in the three species of *Ferrissia* above. The radiating grooves extend out a bit farther from the apical pit, to 0.7–0.8 mm before they terminate. Basch (1963) places *"G." californica* in the synonomy of *F. fragilis* (Tryon).

Laevapex diaphanus. At the exact center of the apex is a small pit like that observed in each of the three *Ferrissia* species described above, and in the two genera which follow. Also, as in *Ferrissia,* there is a relatively smooth

area surrounding the central pit. Beginning at about 0.1 mm from the pit is an area of faint, very shallow, radiating ridges and grooves, which extend distally for 0.4 to 0.6 mm. This sculpturing is very weak, hardly visible, and would seem to be perhaps the degeneration of a sculpture that was once similar to that of *Ferrissia*. The radiating ridges and grooves are about equal in width, and at some places are more prominent than at others. Crossing this obsolescent radial sculpture are concentric, irregularly spaced "growth" wrinkles.

Laevapex fuscus. The sculpturing of this species is nearly identical to that of *L. diaphanus*, except being a little less noticeable, and originating a little farther distally from the central pit. As with *L. diaphanus*, one has the impression that this is the obsolescent pattern of a once much more prominent sculpturing.

Hebetancylus excentricus. At the center of the apex is a pit surrounded by a nearly smooth area. Beginning about 0.1–0.2 mm from the apex are radiating grooves, very shallow and crooked. Although somewhat different from those of *Laevapex*, once again these lines seem to be the remnants of what was once a stronger sculpture in some ancestor. We are tentatively following Basch (1963) in assigning Morelet's "*Ancylus*" *excentricus* to *Hebetancylus*. It has previously been assigned to both *Ferrissia* and *Laevapex* by other authors.

Rhodacmea filosus. The apical tip of the shell is "pushed in" or "dimpled," and lacks strong sculpturing, although the surface is irregular and appears somewhat malleated. A more distinct and patterned sculpture begins about 0.1–0.2 mm radially from the exact center of the apex. This sculpture, weak at first, rapidly becomes prominent. Radiating ridges account for the strongest part of the pattern. Most of them are more or less equally spaced at first. As they radiate distally they diverge, and new, weak radial ridges emerge. The radial ridges continue distally to the apertural edge of the shell, although they

are more or less obliterated at major growth rest areas. Lower, thinner concentric transverse ridges run perpendicular to the radiating ridges.

Rhodacmea rhodacme. The apical sculpture is in nearly all details identical to that of *R. filosus* described above. However, the ridges stop about 12–13 mm from the apical scar, rather than continuing to the shell margin.

Discussion

The importance of apical shell sculpture for delineating species groups within the Ancylidae was first clearly recognized by Walker (1902). A year later (1903) he formally named two new sections, one for North American species with smooth apices (*Laevapex*) and the other for species with radially striate apices (*Ferrissia*). In 1912, Walker gave the name *Burnupia* to those southern African freshwater limpets having radially punctate apices. Pilsbry (1913) described the apices of his new genera *Hebetancylus* and *Uncancylus* as being smooth and pitted respectively. He described (1924) the apex of his new genus *Anisancylus* as being smooth.

We have not studied the South African or South American genera mentioned above, but we have studied all of the currently recognized North American ancylid genera. In regard to apical microsculpture, the North American species clearly fall into three rather sharply contrasting groups. (1) In *Ferrissia* (including *"Gundlachia" californica*) the apex is finely radially striate, the striae consisting of narrow grooves. In these species, the striate top of the apex is bluntly rounded. (2) In *Rhodacmea* the apex is also striate, but the sculptured pattern is quite different. Instead of the grooves being the most prominent part of the sculpture as in *Ferrissia,* it is the spaced radiating cords or ridges that form the basic apical structure. The apex is more acute in *Rhodacmea,* and especially characteristic of the two *Rhodacmea* species studied here, is an indentation or "dimple" (in addition to the apical scar). (3) In *Laevapex* and *Hebetancylus excentricus* the apices are nearly

smooth, showing only a slight radial sculpturing which suggests the degenerative remnants of a once stronger radial sculpture.

The present investigation has not shown the need for any taxonomic revisions from the clearer observations of the shell apical microsculpture as afforded by the SEM. However, our study has shown the apical sculpture of *Ferrissia* in much clearer detail; it has shown that the apices of *Laevapex* and *Hebetancylus excentrica* are not totally smooth as previously thought, but have faint obsolete radiating sculpture, and it has shown the apical sculpture of *Rhodacmea* clearly for the first time. Similar SEM studies on ancylid taxa from other geographic areas may show further apical sculptural differences or similarities, and may help in making phylogenetic assessments in this systematically difficult group.

Literature Cited

Basch, P. F. 1963. A review of the Recent freshwater limpet snails of North America (Mollusca: Pulmonata). Bull. Mus. Comp. Zool. Harvard, 129(8): 401–461.

Bourguignat, M. J. R. 1853. Catalogue des espèces du genre *Ancylus*. J. Conchyliol., 4: 169.

Pilsbry, H. A. 1896. New American Ancylidae. Nautilus, 9(12): 137–139.

———. 1913. Land and fresh-water molluscs of the Stanford expedition to Brazil. Proc. Acad. Natur. Sci. Philad., 65: 618.

———. 1924. South American land and freshwater mollusks. Notes and descriptions. Proc. Acad. Natur. Sci. Philad., 76: 49–66

Walker, B. 1902. Surface sculpture in *Ancylus*. Nautilus, 16(8): 85–88.

———. 1903. Notes on eastern American ancyli. Nautilus, 17(2): 13–18; (3): 25–31.

———. 1912. A revision of the ancyli of South Africa. Nautilus, 25(12): 139–144.

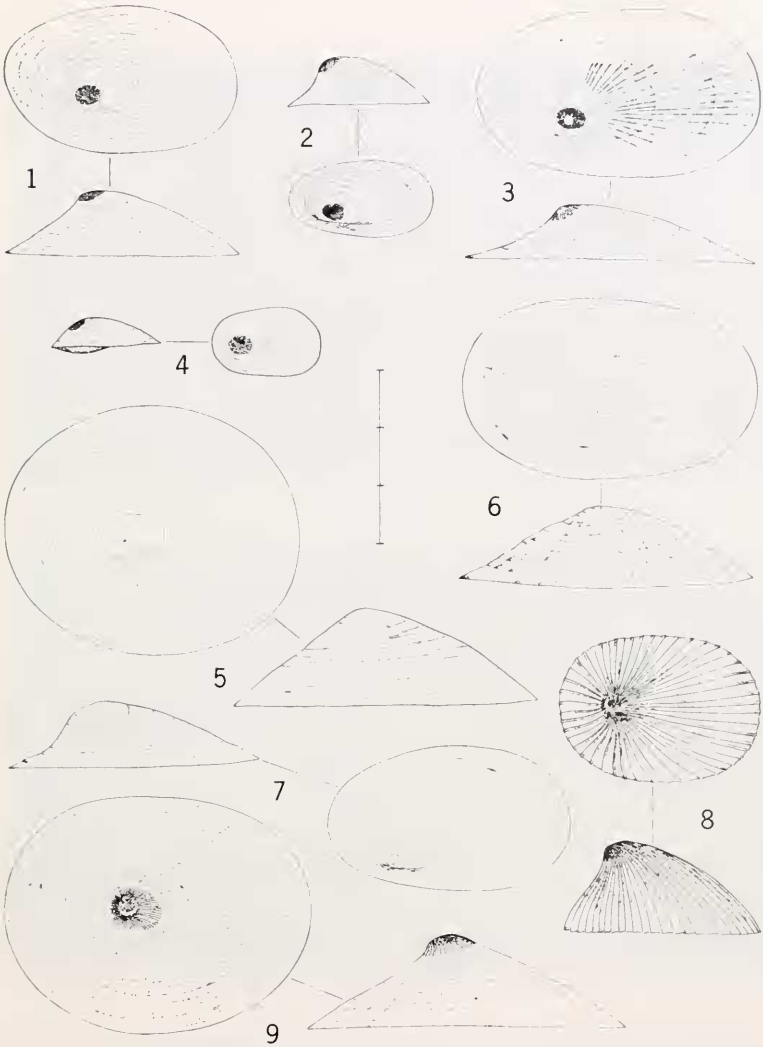

Plate 5. Ancylidae: Top and right side views.
Scale line = 3 mm

Fig. 1. *Ferrissia rivularis* (Say). UMMZ 69189. Fig. 2. *F. shimeki* (Pilsbry). UMMZ 69610. Fig. 3. *F. walkeri* (Pilsbry and Ferriss). UMMZ 101984. Fig. 4. *"Gundlachia" californica* Rowell. UMMZ 143954. Fig. 5. *Laevapex diaphanus* (Haldeman). UMMZ 68922. Fig. 6. *L. fuscus* (Adams). UMMZ 100445. Fig. 7. *Hebetancylus excentricus* (Morelet). UMMZ 100404. Fig. 8. *Rhodacmea filosus* (Conrad). UMMZ 69215. Fig. 9. *R.* (*Rhodocephala*) *rhodacme* Walker. UMMZ 68928.

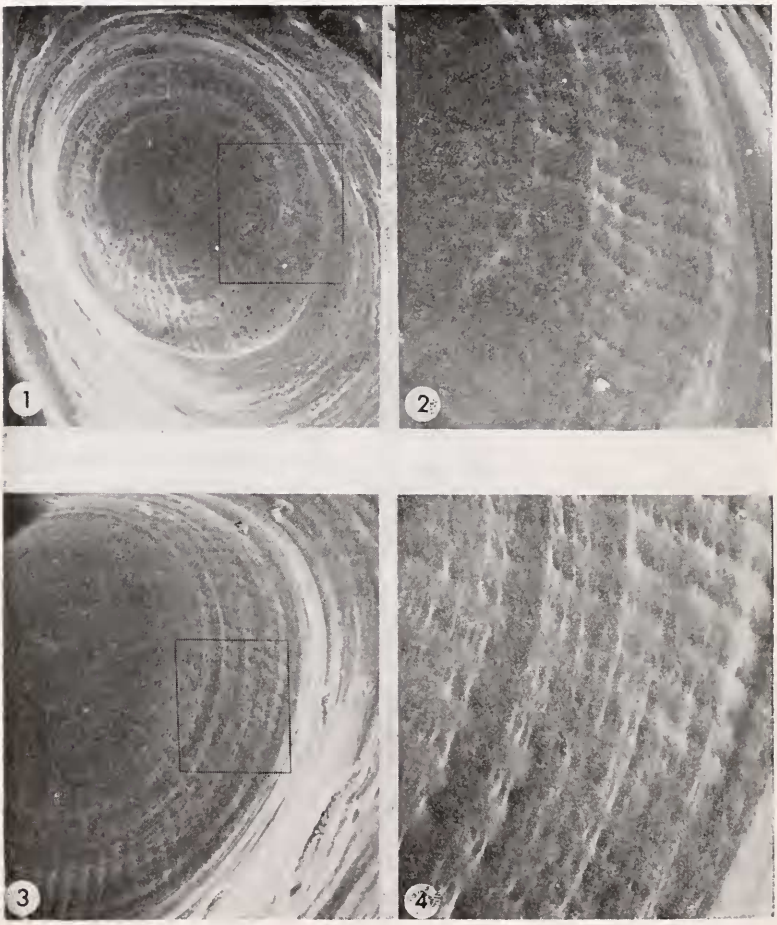

Plate 6.

Fig. 1. *Ferrissia rivularis* (Say). UMMZ 69189 (ca. 110×). Fig. 2. *F. rivularis*. UMMZ 69189 (ca. 340×). Enlargement of area marked in Fig. 1. Fig. 3. *F. shimeki* (Pilsbry). UMMZ 69610 (ca. 170×). Fig. 4. *F. shimeki*. UMMZ 69610 (ca. 560×). Enlargement of area marked in Fig. 3.

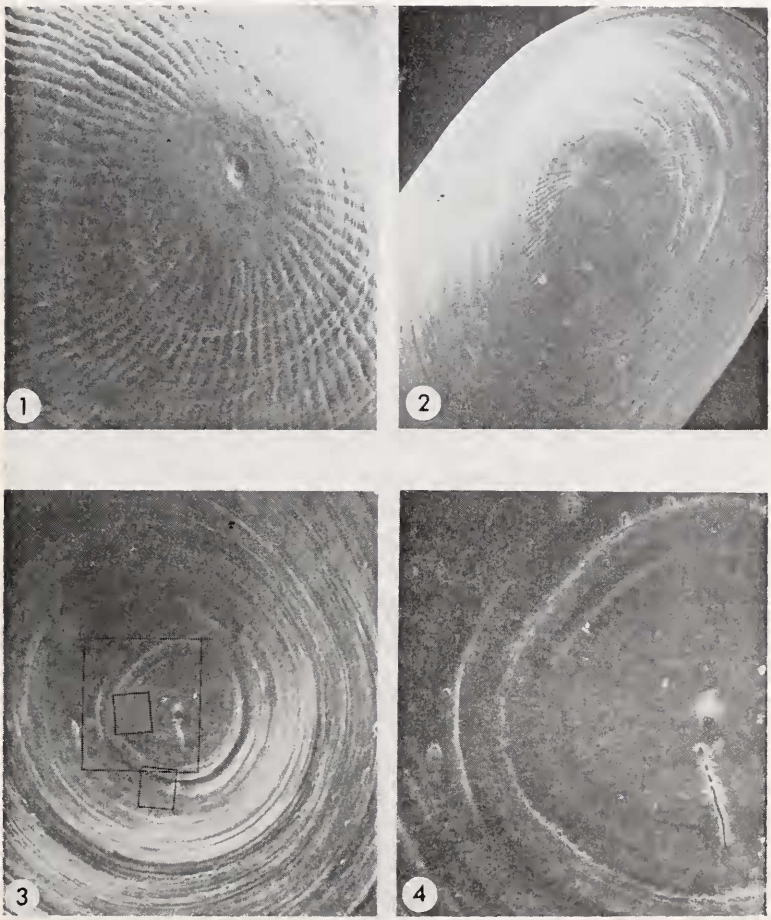

Plate 7.

Fig. 1. *Ferrissia walkeri* (Pilsbry and Ferriss). UMMZ 101984 (ca. 170×). Fig. 2. *"Gundlachia" californica* Rowell. UMMZ 143954 (ca. 56×). Fig. 3. *Laevapex diaphanus* (Haldeman). UMMZ 68922 (ca. 56×). The three squares mark the areas enlarged in Fig. 4 and Pl. 8, Figs. 1 and 2. Fig. 4. *L. diaphanus*. UMMZ 68922 (ca. 170×).

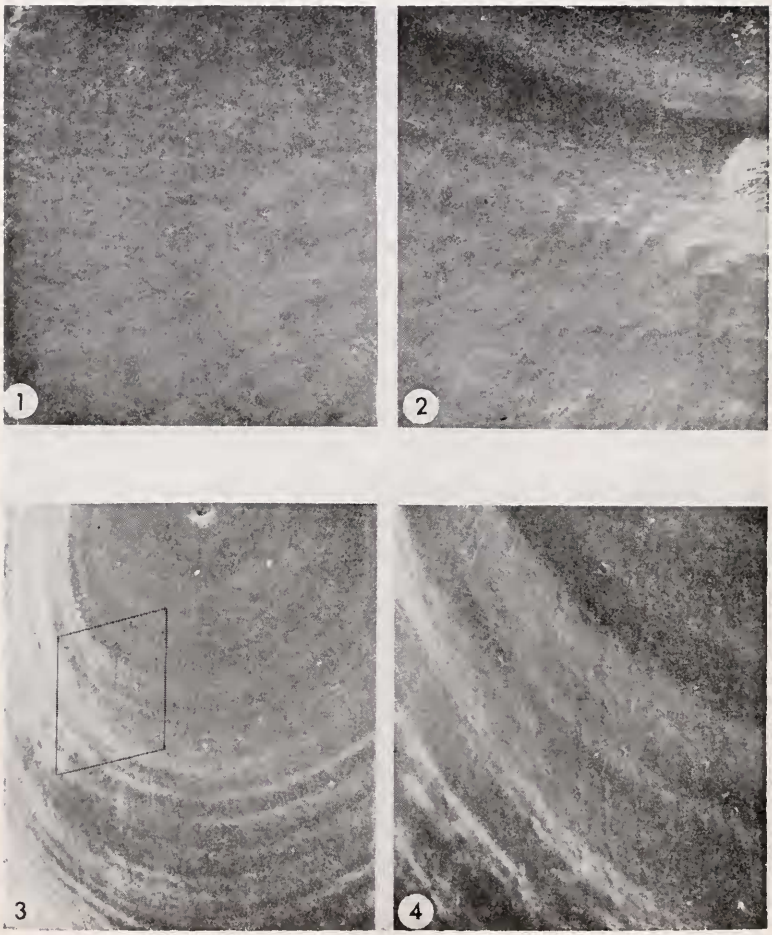

Plate 8.

Fig. 1. *Laevapex diaphanus* (Haldeman). UMMZ 68922 (ca. 560×). Enlargement of area marked in Pl. 7, Fig. 3. Fig. 2. *L. diaphanus*. UMMZ 68922 (ca. 560×). Enlargement of area marked in Pl. 7, Fig. 3. Fig. 3. *Hebetancylus excentricus* (Morelet) UMMZ 100404 (ca. 170×). The square marks the area enlarged in Fig. 4. Fig. 4. *H. excentricus*. UMMZ 100404 (ca. 560×).

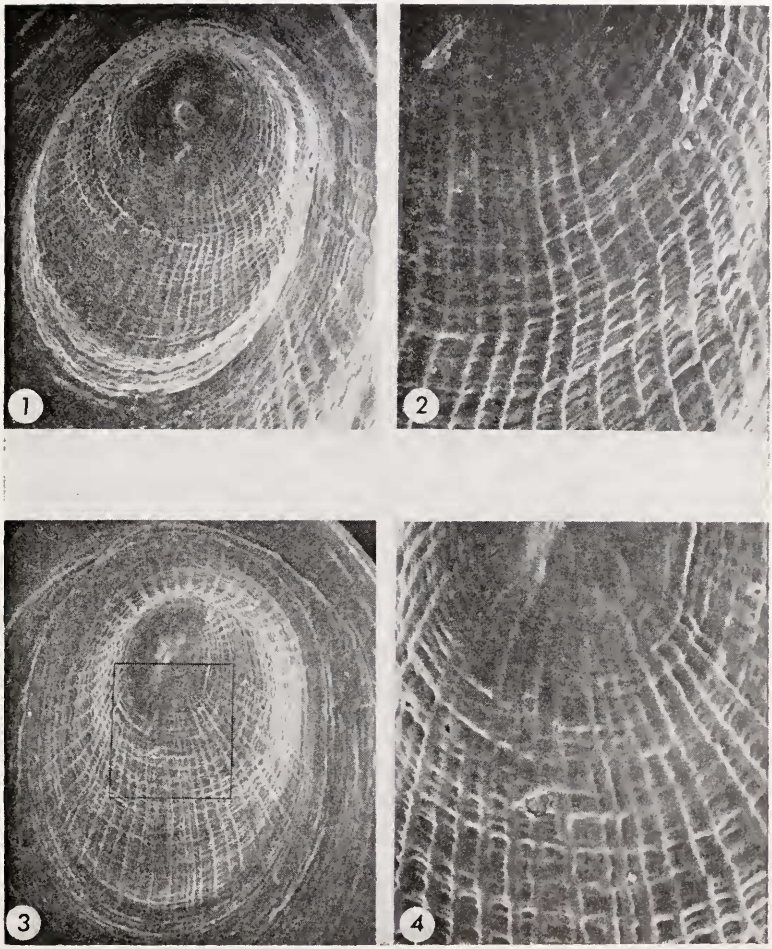

Plate 9.

Fig. 1. *Rhodacmea* (*Rhodocephala*) *rhodacme* Walker. UMMZ 68928 (ca. 56×). Fig. 2. *R.* (*Rhodocephala*) *rhodacme*. UMMZ 68928 (ca. 170×). Fig. 3. *R. filosus* (Conrad). UMMZ 69215 (ca. 56×). The square marks the area enlarged in Fig. 4. Fig. 4. *R. filosus*. UMMZ 69215 (ca. 170×).